

# elevation

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## UKFloodMap™ – raising the stakes for pluvial and river flood risk underwriting

By Dr. Justin Butler, Managing Director, Ambiental  
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Increasing flood losses, coupled with rapid business change, technological advancement, and new legislation (e.g., Solvency II), mean that insurers must continuously improve their underwriting performance so they can remain competitive and successfully expand into new markets. In the aftermath of multiple extreme flood events and the associated losses over the past decade, flood risk is now perceived by many insurers as the natural peril with the highest loss-generating potential, both in the United Kingdom and internationally.

As such, new tools, data, information, and systems are required to better manage flood risk and price it more effectively. Now, more insurance companies are starting to collect and analyse policy and exposure information at the individual address as well as unit postcode level; this process change provides underwriters and risk managers with an opportunity to better manage accumulations and fine-tune underwriting practices. Improving loss control whilst generating additional premium income in lower risk locations which may have been previously referred or priced high, can now be achieved using better, high-resolution data.

### The Scale of the U.K. Flood Problem

Overall, one in six homes in England is at risk of flooding. The U.K. Environment Agency (EA) recognises that although more than 2.4 million properties are at risk of fluvial flooding, one million of these are also vulnerable to surface water flooding, with an additional 2.8 million properties susceptible to surface water flooding alone.<sup>1</sup> On this basis, pluvial flood risk is even more widespread than river or coastal flooding.

Projected outcomes using U.K. government data suggest the cost of flooding is likely to increase by the order of 30 – 40 times by 2080. This means flooding could cost the U.K. economy up to £42 billion on average every year, in today's prices.<sup>2</sup>

### Surface Water or “Pluvial” Flooding

Pluvial flooding is defined as flooding that results from rainfall-generated overland flow and ponding in depressions before the runoff enters any watercourse or sewer.<sup>3</sup>

*“This data has provided us with a step-change in the way that we underwrite flood risk in the U.K. Visualisation and analysis of flood risk at the individual address level is now a much easier, quicker, and more precise process for us.”*

- Chubb Insurance Company of Europe

### Natural Environment Research Council

Pluvial flooding occurs quickly and is difficult to predict due to critical factors such as rainfall volume, location, and intensity. In urban areas, sudden and intense rainfall cannot drain away as quickly as it can in rural areas where the soil is exposed. Pluvial flooding is most common in urban areas where natural and manmade drainage systems do not have sufficient capacity to accommodate the volume of rainfall.

(See UKFloodMap on page 2)

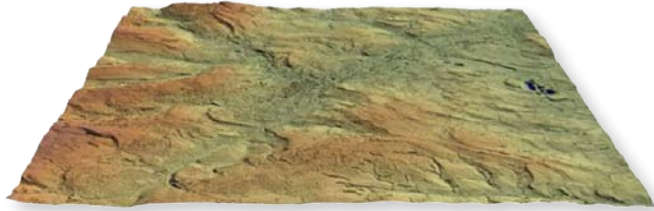
## Intermap's Automatic Address Update Service introduced in Slovakia

Intermap Technologies® has introduced the Automatic Update Service of the Reference Address Database to the Slovak market. As a component of Intermap's® risk management applications (RMA), the tool provides quick access to the most up-to-date and accurate reference address database, which includes addresses, their geographic coordinates, and their respective natural hazard information.

### Complete and accurate coverage

To support the insurance industry, Intermap has developed GIS-based underwriting tools, such as the RMA Underwriting Toolkits, Offline RMA Toolkits (desktop hazard lookup tools), various customized RMA Enterprise solutions, as well as the Public Portal of the Czech Insurance Association (ČAP).

(See Address-based Update on page 3)



High-resolution digital terrain model (DTM).

## Summer 2007 Flooding

In June 2007, an excess of 150 mm of rain fell over much of Wales, the Midlands, northern England, Northern Ireland, and parts of Scotland and southwest England, with over 250 mm in some places; this represents more than three times the average June rainfall in many locations.

Following the summer 2007 flooding, the Association of British Insurers (ABI) estimated the total industry cost to be £3 billion, making it the largest natural catastrophe insurance loss ever recorded in the United Kingdom.<sup>4</sup> The ABI also reported that insurers dealt with over 27,000 commercial claims, and paid out a total of £1 billion in claims from small businesses.

## Light at the end of the tunnel

By recognising the increasing threat from pluvial as well as river and tidal flooding, insurers are now facing a number of key challenges. Insurers have found that in order to better manage risk whilst remaining profitable, it is essential to have access to detailed flood risk maps and models.

Until recently, insurers have not had access to high-resolution flood modelling of surface-water flood risk, due to the lack of: (i) a consistent digital terrain model (DTM) that provides sufficient detail to understand risk at individual property levels in complex, urban environments; and (ii) numerical modelling tools with adequate processing power to route flows around individual buildings for entire countries. Many insurance companies now recognise that government-produced flood

maps may no longer be sufficient, especially in cases where ease-of-access, flexibility, and building-level risk-rating capabilities are of primary importance.

In response to specific insurance client requirements, Ambiental<sup>®</sup>, in collaboration with Intermap Technologies, has consolidated its existing U.K.-wide river, tidal, and pluvial flood risk datasets into a single, comprehensive product – UKFloodMap<sup>™</sup>.

Built on Intermap's NEXTMap<sup>®</sup> Britain v2.0 DTM, which incorporates the entire EA LiDAR database and features an unprecedented level of accuracy and detail, UKFloodMap includes modelled flood risk data for river, tidal, and pluvial perils within a unique multi-layered dataset.

Using Ambiental's scientifically validated Flowroute<sup>™</sup> flood simulation software, powered by cloud computing technology, the risk of surface water flooding has been modelled rigorously while maintaining building-level accuracy across the entire United Kingdom. Building-level pluvial water depths are determined and classified as high (>75cm), medium (50–75cm), low (25–50cm), or no significant hazard. River and tidal perils have been modelled using multiple return period events, including 100-year, 250-year, 500-year, and 1000-year flood extents and depths.

The UKFloodMap dataset is now available in flat file format (GIS files and unit postcode level databases) or as an integrated package within Intermap's risk management applications (RMA).

The UKFloodMap dataset's capability to show various layers of information enables insurers to present various flood risk scenarios to customers, brokers, and internal underwriting teams more quickly, easily, and cost-effectively than was previously possible. The functionality also allows insurers to get a better handle on context by being able to view flood risk within a wider area. With the ability to see the whole picture across a building complex or site and within the surrounding area and access roads, underwriters now have a more complete view of the risk, enabling better decision making, improved loss control, and accumulation management.

Integrating the UKFloodMap data within the RMA enables underwriters to assess and visualise individual risks online, whilst being able to run accumulation and risk analysis reports for entire portfolios by taking all the flood perils into account.

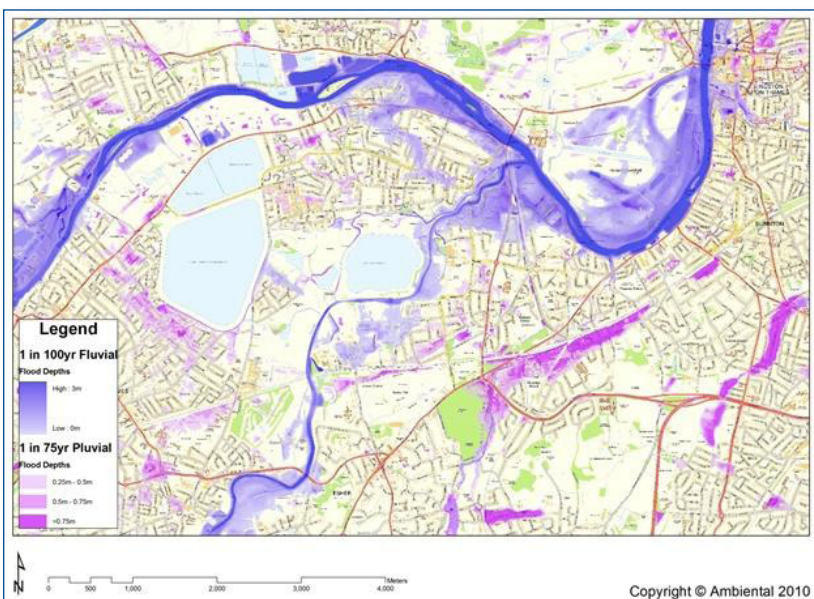
This new U.K.-wide flood risk mapping and assessment solution is already starting to improve customer awareness about flood risk. This, in turn, will help to improve mitigation and loss control within the continuously evolving and highly competitive U.K. insurance marketplace. ■■■

<sup>1</sup> Environment Agency, 2008 <http://publications.environment-agency.gov.uk/pdf/GEH00609BQDS-E-E.pdf>

<sup>2</sup> Evans, E. et al. 2004. Foresight. Future Flooding. Scientific Summary: Volume I Future risks and their drivers.

<sup>3</sup> NERC – Natural Environment Research Council <http://www.nerc.ac.uk>

<sup>4</sup> ABI, 2007 <http://www.ambiental.co.uk/FRA-legislation/ABI%20%282007%29%20Summer%20Floods%20review.pdf>



UKFloodMap extract showing river and pluvial flood risks down to the individual building level.

# Address-based Update *from page 1*

These solutions require accurate address validation of specific insured sites so that natural hazard information can be properly linked to the site. In the central and eastern European markets, widely available address searching applications such as Google or Bing may not provide sufficient results for the non-life insurance industry. Most importantly, they rarely provide full address coverage; further, address locations are often interpolated along streets, thereby providing less-accurate coordinates. Additionally, readily available applications do not allow clients to save their coordinates for sites – a much-needed function when validating addresses and property locations. To ensure proper address validation and property location, Intermap introduced reference address databases for RMA applications that help provide the best-possible results and minimize the number of unsuccessful address searches by the client.

## Tool already in use by a large clientele

From a geographic perspective, the non-life insurance market is a very dynamic field because there are a number of newly built houses and buildings that need to be insured. The reference address databases need to be up-to-date and, if possible, the updates need to be available immediately. The Reference Address Database Automatic Update, an automatic tool developed by Intermap, helps to reduce the time delay between the time at which a new update becomes available, and the time at which the client database has been updated. The Update also decreases the manual effort and the number of errors introduced by the user or the data processor.

Many existing customers in the Czech insurance market already use the tool. Insurers belonging to various multi-national groups such as Generali, VIG, Allianz, W&V, KBC, RSA, Aegon, and Triglav use the service directly or indirectly to update their underwriting systems, RMA Enterprise toolkits, offline laptop-based retail applications, or their internal GIS environments. For example, the ČAP Public Portal uses the tool indirectly to enable the public to search for addresses of its sites using the most up-to-date address data.

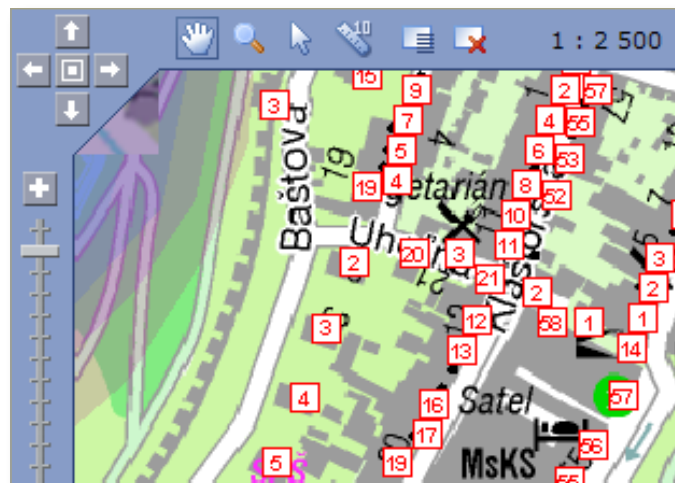
## Technology, data content, and providers

The tool transforms the newest reference address update from the data provider (i.e., a state authority, private company, or a mixture of both) into a common format, and then updates the client database. In Slovakia, the updates of the address database are currently available quarterly; the frequency will increase to monthly in 2011.

The updates include adding new addresses, deleting obsolete addresses, and updating existing addresses with a more accurate location, a changed street name or house number, or natural hazard information.

The reference address data contains three types of information condensed in a relational database:

1. Natural hazard information: Currently, river flood hazard information is available for the Slovak clients, and is provided by flood extent maps for several return periods.



Door-step address points displayed as house numbers on the top of the street-level city map of downtown Levoča.

2. Map coordinates: GPS coordinates and coordinates in the national coordinate systems can be provided to correctly localize the insured site. Since not all coordinates are accurate to the specific house or building, the geo-coding accuracy indicates whether an address is localized within doorstep accuracy, or to street, neighbourhood, or municipality accuracy levels.
3. Structural information: To find or validate the address of an insured site, information such as the street name, house number, post code, city name, neighbourhood name, as well as district or province names are included in the database. It also handles unique cases specific to Slovakia, such as street-based versus neighbourhood-based house numbers, multiple districts within a single city, multiple “large districts” within a single “small district,” a postal municipality that differs from the municipality of the address, and other special cases.

Currently, Intermap provides the flood hazard information and Mapa Slovakia Digital provides the structural address information as well as the door-step coordinates for the tool in Slovakia.

## Additional services, added value

In addition to the wide range of underwriting tools, Intermap’s clients can also benefit from regularly updated addresses in other tools and services. Bulk address cleaning, geo-coding, and batch risk assessment are also based on the updated address databases. Intermap’s Exposure Modelling and Nat-Cat models of reinsurance brokers and other modellers require localization of insured sites based on up-to-date addresses and address coordinates as well. Furthermore, clients’ Internet insurance applications use Web services that benefit from the automatic updates to the address database.

## Early warning system and loss estimation before and after flooding

Sudden flooding in the Czech Republic during May and August 2010 caused huge losses in property. This past summer, Intermap Technologies® introduced a much-needed service that allows Czech insurance companies to evaluate potential flood risks. The Flood Early Warning System is designed primarily for insurance companies and their clients whose property could be immediately in danger of river flooding; it also helps support the companies' internal decisions during flood events.

### Model inputs

Input data for the Flood Early Warning System includes:

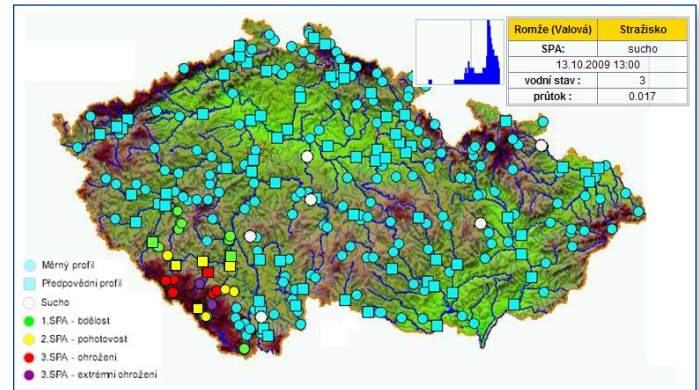
- flood hazard zones
- current water levels and flows from CHMI gauges, downloaded regularly
- client portfolio of insured properties

Online data from the Czech Hydrometeorological Institute's (CHMI) gauging stations provides important information about flood activity level; the system uses this data to evaluate the river's present flow and flood hazard zones for a range of return periods.

### Output forms for flood risk evaluation

The Flood Early Warning System is designed to provide several types of output that can be used on their own or together, according to clients' needs and workflows.

The application presents flood warning information on the map in multiple ways – ranging from a simple view that highlights linear segments of the river where flooding occurs, to more



Gauging stations warnings – CHMI.

complex views that depict the flooded areas including the river and the surrounding terrain. The insured sites that are at risk for flooding are highlighted on the map for the user's quick evaluation.

The application provides export functionality and additional output forms for linking to the insurer's internal processes or directly to the insured policy holder. A list of potentially damaged insured sites can be exported and provided to specific departments for further evaluation and processing. The insurance company can notify affected clients via a warning SMS or email. For claim handling, potential loss estimation can be calculated for the affected area.

### Benefits for the insurer

The Early Warning extension of Intermap's® risk management applications (RMA) offers several advantages to clients. For flood loss prevention, the client can, before a flood occurrence, obtain information about which insured sites are at risk for flooding. For claim handling, the application helps insurers plan labour resources and allocate finances more quickly. Moreover, the application enables insurance fraud detection by comparing the affected areas with the locations of claimed losses. Further, the quick estimation of potential loss can assist the insurer with resource allocation.

A	B	C	D	E	F	
1	Name	Address1	City	State	Zip	Phone
2	Amherst	H&F Amity	Amherst	MA	01002	(413) 256
3	Pelham	01376 Amherst Road	Amherst	MA	01002	(413) 253
4	Porter	Phi 130 River Drive	Hadley	MA	01026	(413) 594
5	Hampden	616 Main Street	Hampden	MA	01036	(413) 594
6	Children's	444 Dought Street	Holyoke	MA	01040	(413) 536
7	Valleyball	171 Pine Street	Holyoke	MA	01040	(413) 536
8	Northampton	46 Bridge Street	Northampton	MA	01060	(413) 594
9	Wood B	40 Main Street	Northampton	MA	01060	(413) 596
10	Umocourt	Route 116 Amherst Road	South Had.MA	01076	(413) 462	

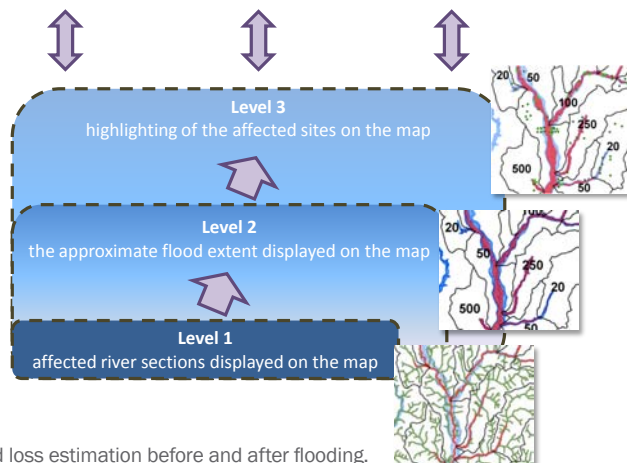
Export of the list of potentially endangered insured sites



Sending a warning SMS to the clients in danger



Possible loss estimation within the affected area



Early warning system and loss estimation before and after flooding.

Specialized departments within insurance companies like Risk Management, Claim Handling, Reinsurance, Product Management, etc. can make use of this system to improve the processes described above.

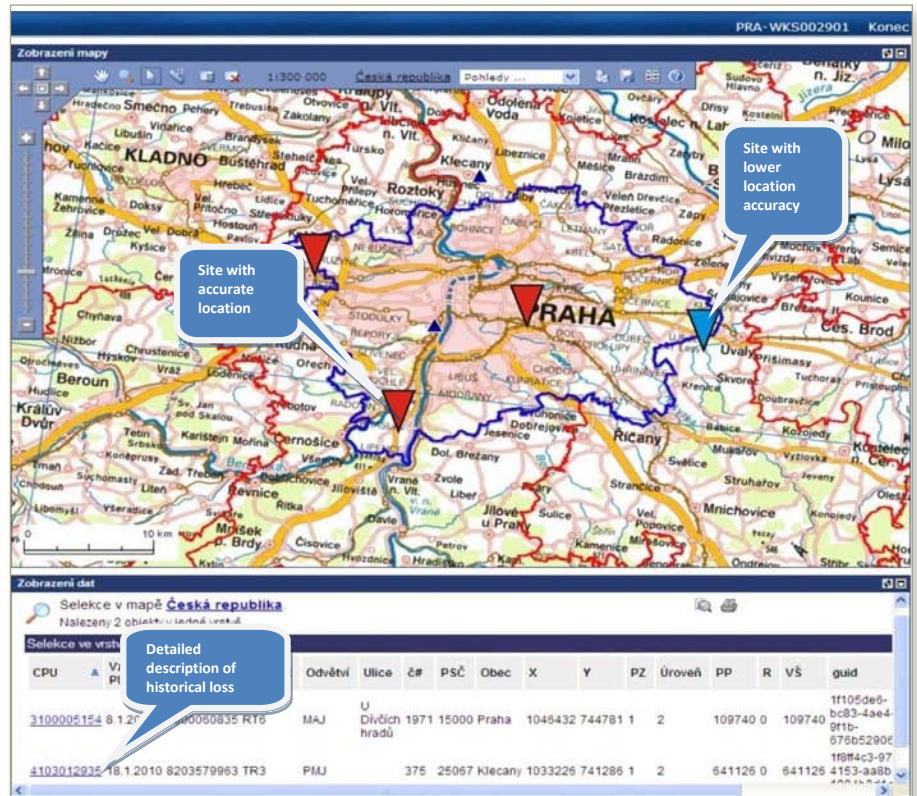
(See Warning System on page 5)

## Visualization of Clients' Historical Losses

To support decision making in the underwriting process, as much information as possible should be available for a particular site; past claim data can help provide additional information. Additional functionality was developed for the Flood Early Warning System to help insurers analyze the claim history of particular sites, and to verify information from clients about historical flood events at their respective addresses.

For example, an insurance company can use the application to verify a client's claim that his / her property has never been flooded and is looking to be insured, or to assess the flood risk of a property that is located off the floodplain where flood maps are not available.

The application can quickly determine if any loss occurred at a particular site in the past by using historical data from the insurance company. A visualization of historical losses is displayed on the map, representing different location accuracies. In addition, a detailed description of each flood loss is situated under the map window. The content depends on the input information such as the claim date, address, identification number, coordinates, loss amount, loss



Visualization of clients' historical losses.

accumulation, etc. The application is valuable for underwriting experts, allowing easy orientation in property insurance processes and providing a visualized overview of existing claims for all of the Czech Republic.



### About Intermap Technologies

Intermap Technologies® is a digital mapping company that is creating uniform, high-resolution 3D digital models of the earth's surface. Intermap has completed the remapping of entire countries and has built uniformly accurate national databases, called NEXTMap®. The company's digital elevation data and geometric imagery are enabling a wide variety of commercial applications, including risk management.

Intermap's® risk management applications improve the evaluation and controlling of hazard risks – and enable easy and immediate access to sophisticated, geospatially accurate risk management.

Headquartered in Denver, Colorado, USA, Intermap has additional offices in Munich, Prague, London, Paris, Jakarta, Bratislava, Detroit, and Washington D.C.



### About Ambiental

Ambiental® (www.ambiental.co.uk) is a leading UK-based data provider and flood risk assessment company. It operates internationally, helping insurers, property developers and risk managers to better understand and communicate flood risk and other natural perils in response to growing legislative, commercial, and environmental drivers.

The company's core technology product Flowroute™ is a highly efficient, innovative, fast and easy-to-understand solution for predicting the depth, duration and extent of flood risk to individual properties. Building upon the success of Flowroute™, Ambiental have developed leading-edge digital data products for river, tidal and surface water flood risk mapping and modelling for at-risk areas in the U.K., USA, Europe, and Asia.